

WHAT IS CLAIMED IS:

1. A stable liquid biuret modified diphenylmethane diisocyanate comprising a secondary amine based biuret modified diphenylmethane diisocyanate having an NCO group content of 12 to 30% by weight,  
5 comprising:
  - (a) a secondary monoamine group containing compound which may be aliphatic, aromatic or araliphatic;  
and
  - (b) diphenylmethane diisocyanate having an NCO group content of about 33.6% and comprising:
    - (i) from 0 to 60% by weight of 2,4'-diphenylmethane diisocyanate,
    - (ii) less than 6% by weight of 2,2'-diphenylmethane diisocyanate;
    - 15 and  
(iii) the balance being 4,4'-diphenylmethane diisocyanate, wherein the %'s by weight of (b)(i), (b)(ii) and (b)(iii) total 100% by weight of (b).
2. The stable liquid biuret modified diphenylmethane  
20 diisocyanate of Claim 1, wherein the NCO group content is from about 16 to about 28% by weight.
3. The stable liquid biuret modified diphenylmethane diisocyanate of Claim 1, wherein (a) said secondary monoamine group containing compounds have a molecular weight of from about 45 to about  
25 600.
4. The stable liquid biuret modified diphenylmethane diisocyanate of Claim 1, wherein (a) said secondary monoamine group containing compounds are selected from the group consisting of dipropylamine, dibutylamine, dipentylamine, dihexylamine and  
30 dioctylamine.

5. The stable liquid biuret modified diphenylmethane diisocyanate of Claim 1, wherein (b) said diphenylmethane diisocyanate comprises:

5           (i) from about 1.5 to about 54% by weight of 2,4'-diphenylmethane diisocyanate,  
             (ii) less than 2% by weight of 2,2'-diphenylmethane diisocyanate,

and

10           (iii) the balance being 4,4'-diphenylmethane diisocyanate, wherein the %'s by weight of (b)(i), (b)(ii) and (b)(iii) total 100% by weight of (b).

6. A process for the preparation of a stable liquid biuret modified diphenylmethane diisocyanate comprising a secondary amine based biuret modified diphenylmethane diisocyanate having an NCO group content of 12 to 30% by weight, comprising

15           (1) reacting  
             (a) a secondary monoamine group containing compound which may be aliphatic, aromatic or araliphatic;  
             with  
20           (b) diphenylmethane diisocyanate having an NCO group content of about 33.6% and comprising:  
             (i) from 0 to 60% by weight of 2,4'-diphenylmethane diisocyanate,  
             (ii) less than 6% by weight of 2,2'-diphenylmethane diisocyanate,  
25           and  
             (iii) the balance being 4,4'-diphenylmethane diisocyanate, wherein the %'s by weight of (b)(i), (b)(ii) and (b)(iii) total 100% by weight of (b);  
30           in the presence of  
             (c) at least one allophanate catalyst.

7. The process of Claim 6, wherein said stable liquid diphenylmethane diisocyanate has an NCO group content of from about 16 to about 28% by weight.

8. The process of Claim 6, wherein (a) said secondary 5 monoamine group containing compounds have a molecular weight of about 45 to about 600.

9. The process of Claim 6, wherein (a) said secondary monoamine group containing compounds are selected from the group consisting of dipropylamine, dibutylamine, dipentylamine, dihexylamine 10 and dioctylamine.

10. The process of Claim 6, wherein (b) said diphenylmethane diisocyanate comprises:

(i) from about 1.5 to about 54% by weight of 2,4'-diphenylmethane diisocyanate,  
15 (ii) less than 2% by weight of 2,2'-diphenylmethane diisocyanate,

and

(iii) the balance being 4,4'-diphenylmethane diisocyanate,  
20 wherein the %'s by weight of (b)(i), (b)(ii) and (b)(iii) total 100% by weight of (b).

11. A stable liquid biuret allophanate modified diphenylmethane diisocyanate having an NCO group content of 12 to 30% by weight, and comprising

(a) a secondary monoamine group containing compound which 25 may be aliphatic, aromatic or araliphatic;  
(b) diphenylmethane diisocyanate having an NCO group content of about 33.6% and comprising:

(i) from 0 to 60% by weight of 2,4'-diphenylmethane diisocyanate,  
30 (ii) less than 6% by weight of 2,2'-diphenylmethane diisocyanate,  
and

(iii) the balance being 4,4'-diphenylmethane diisocyanate, wherein the %'s by weight of (b)(i), (b)(ii) and (b)(iii) total 100% by weight of (b);

and

5 (c) an aliphatic or aromatic alcohol.

12. The stable liquid biuret allophahate modified diphenylmethane diisocyanate of Claim 11, wherein the NCO group content is from about 16 to about 28% by weight.

13. The stable liquid biuret allophanate modified 10 diphenylmethane diisocyanate of Claim 11, wherein (a) said secondary monaomine group containing compounds have a molecular weight of from about 45 to about 600.

14. The stable liquid biuret allophanate modified diphenylmethane diisocyanate of Claim 11, wherein (b) said 15 diphenylmethane diisocyanate comprises:

- (i) from about 1.5 to about 54% by weight of 2,4'-diphenylmethane diisocyanate,
- (ii) less than 2% by weight of 2,2'-diphenylmethane diisocyanate,

20 and

(iii) the balance being 4,4'-diphenylmethane diisocyanate, wherein the %'s by weight of (b)(i), (b)(ii) and (b)(iii) totals 100% by weight of (b).

15. The stable liquid biuret allophanate modified 25 diphenylmethane diisocyanate of Claim 11, wherein (c) said aliphatic alcohol has from 1 to 36 carbon atoms and said aromatic alcohol has from 5 to 20 carbon atoms.

16. A process for the preparation of a stable liquid biuret allophanate modified diphenylmethane diisocyanate having an NCO group 30 content of 12 to 30% by weight, comprising:

(1) reacting

(a) a secondary monoamine group containing compound which may be aliphatic, aromatic or araliphatic;

5 (b) diphenylmethane diisocyanate having an NCO group content of about 33.6% and comprising:

(i) from 0 to 60% by weight of 2,4'-diphenylmethane diisocyanate,

(ii) less than 6% by weight of 2,2'-diphenylmethane diisocyanate,

10 and

(iii) the balance being 4,4'-diphenylmethane diisocyanate, wherein the %'s by weight of (b)(i), (b)(ii) and (b)(iii) total 100% by weight of (b);

and

15 (c) an aliphatic alcohol or an aromatic alcohol;

in the presence of

(d) at least one allophanate catalyst.

17. The process of Claim 16, wherein the NCO group content is from about 16 to about 28% by weight.

20 18. The process of Claim 16, wherein (a) said secondary monoaomine group containing compounds have a molecular weight of from about 45 to about 600.

19. The process of Claim 16, wherein (b) said diphenylmethane diisocyanate comprises:

25 (i) from about 1.5 to about 54% by weight of 2,4'-diphenylmethane diisocyanate,

(ii) less than 2% by weight of 2,2'-diphenylmethane diisocyanate,

and

30 (iii) the balance being 4,4'-diphenylmethane diisocyanate, wherein the %'s by weight of (b)(i), (b)(ii) and (b)(iii) totals 100% by weight of (b).

20. The process of Claim 16, wherein (c) said aliphatic alcohol has from 1 to 36 carbon atoms and said aromatic alcohol has from 5 to 20 carbon atoms.

21. A stable liquid prepolymer of biuret modified  
5 diphenylmethane diisocyanate having an NCO group content of about 6 to about 28% by weight, comprising

(A) the stable liquid biuret modified diphenylmethane diisocyanate of Claim 1;

and

10 (B) an isocyanate-reactive component selected from the group consisting of (1) one or more diols having a molecular weight of 76 to 200, (2) one or more polyether polyols having a molecular weight of from 300 to 6000 and containing from about 1.5 to about 6 hydroxyl groups and (3) mixtures  
15 thereof.

22. The stable liquid prepolymer of Claim 21, wherein the NCO group content is from about 15 to 26% by weight.

23. The stable liquid prepolymer of Claim 21, wherein (B)(1) said diols are selected from the group consisting of 1,3-butanediol,  
20 1,2-propylene glycol, dipropylene glycol, tripropylene glycol and mixtures thereof, and (B)(2) said polyether polyols having molecular weights of from about 400 to about 4,800 and functionalities of from about 1.8 to about 3.

24. A process for the preparation of a stable liquid prepolymer of biuret modified diphenylmethane diisocyanate having an NCO group content of about 6 to 28% by weight, comprising:

(1) reacting:

(A) the stable liquid biuret modified diphenylmethane diisocyanate of Claim 1,

with

30 (B) an isocyanate-reactive component selected from the group consisting of (1) one or more diols having a molecular weight of 76 to 200, (2) one or more polyether polyols having a

molecular weight of from 300 to 6000 and containing from about 1.5 to about 6 hydroxyl groups and (3) mixtures thereof;

at a temperature is from about 40 to 80°C for about 1 to 4 hours.

5        25.      The process of Claim 24, wherein the temperature is from about 60 to about 65°C for about 2 hours.

26.      The process of Claim 24, wherein the stable liquid prepolymer of biuret modified diphenyl diisocyanate has an NCO group content of from about 15 to about 26% by weight.

10        27.      The process of Claim 24, wherein (B)(1) said diols are selected from the group consisting of 1,3-butanediol, 1,2-propylene glycol, dipropylene glycol, tripropylene glycol and mixtures thereof, and (B)(2) said polyether polyols having molecular weights of from about 400 to about 4,800 and functionalities of from about 1.8 to about 3.

15        28.      A stable liquid prepolymer of biuret allophanate modified diphenylmethane diisocyanate having an NCO group content of 6 to 28% and comprising:

(C)      the stable liquid biuret allophanate modified diphenylmethane diisocyanate of Claim 11;

20        and

(B)      an isocyanate-reactive component selected from the group consisting of (1) one or more diols having a molecular weight of 76 to 200, (2) one or more polyether polyols having a molecular weight of from 300 to 6000 and containing from about 1.5 to about 6 hydroxyl groups and (3) mixtures thereof.

25        29.      The stable liquid prepolymer of Claim 28, wherein the NCO group content is from about 15 to 26% by weight.

30. The stable liquid prepolymer of Claim 28, wherein (B)(1) said diols are selected from the group consisting of 1,3-butanediol, 1,2-propylene glycol, dipropylene glycol, tripropylene glycol and mixtures thereof, and (B)(2) said polyether polyols having molecular weights of from 5 about 400 to about 4,800 and functionalities of from about 1.8 to about 3.

31. A process for the preparation of a stable liquid prepolymer of biuret allophanate modified diphenylmethane diisocyanate having an NCO group content of 6 to 28% by weight, comprising:

(1) reacting:

10 (C) the stable liquid biuret allophanate modified diphenylmethane diisocyanate of Claim 11,

with

15 (B) an isocyanate-reactive component selected from the group consisting of (1) one or more diols having a molecular weight of 76 to 200, (2) one or more polyether polyols having a molecular weight of from 300 to 6000 and containing from about 1.5 to about 6 hydroxyl groups and (3) mixtures thereof;

wherein the temperature ranges from about 40 to 80°C for about 1 to 4 20 hours.

32. The process of Claim 31, wherein the temperature ranges from about 60 to about 65°C for about 2 hours.

33. The process of Claim 31, wherein the stable liquid prepolymer of biuret allophanate modified diphenylmethane diisocyanate 25 has an NCO group content of from about 15 to about 26% by weight.

34. The process of Claim 31, wherein (B)(1) said diols are selected from the group consisting of 1,3-butanediol, 1,2-propylene glycol, dipropylene glycol, tripropylene glycol and mixtures thereof, and (B)(2) said polyether polyols having molecular weights of from about 400 to 30 about 4,800 and functionalities of from about 1.8 to about 3.